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### CLAIMS

1. Process for preparing one or more iodinated organic substances having a molecular mass of less than 2000 (substances (S)) using:

- 5 (A) at least one free-radical-generating substance chosen from peroxides, diazo compounds, dialkyldiphenylalkanes, substances derived from tetraphenylethane, boranes and iniferter substances comprising at least one thiuram disulphide group,
- (B) at least one organic substance containing at least one ethylenic double bond, capable of adding a free radical to its ethylenic double bond,
- 10 (C) molecular iodine,

which comprises the steps according to which:

- (1) at least a fraction of (A), at least a fraction of (B) and at least a fraction of (C) are introduced into a reactor, and then
- 15 (2) the contents of the reactor are caused to react, while introducing therein the possible remainder of (A), the possible remainder of (B) and the possible remainder of (C), until a moment is reached when the content of the reactor is a mixture comprising one or more substances (S) [mixture (M)].

20 2. Process according to Claim 1, characterized in that the substance(s) (S) have a molecular mass of less than 1000.

3. Process according to Claim 1 or 2, characterized in that the substance(s) (S) have a number-average molecular mass of less than 500.

25 4. Process according to Claim 1, 2 or 3, characterized in that the contents of the reactor are caused to react until the quantity of (B) consumed by the reaction no longer changes.

5. Process according to Claim 4, characterized in that the number of moles of (C) expressed relative to the number of moles (A) is greater than or equal to 100%.

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6. Process according to Claim 1, 2, or 3, characterized in that it additionally comprises a step (3), following step (2), according to which the reaction in progress is stopped.

7. Process according to Claim 6, characterized in that the moment when the reaction in progress is stopped is that when the colour of the contents of the reactor changes from a dark colour to a light colour.

8. Process according to Claim 6 or 7, characterized in that the number of moles of (C) expressed relative to the number of moles of (A) is less than 100%.

9. Process according to any one of the preceding claims, characterized in that it additionally comprises a step, following step (2) and, furthermore, following step (3), when the process comprises the said step (3), according to which at least one substance (S) of the mixture (M) and possible other substances (S) contained in the mixture (M) are isolated.

10. Mixture comprising at least 2 iodinated organic substances having a molecular mass of less than 2000, corresponding respectively to the general formulae  $R-G_x(CX_2-CXY-)_n-I$  and  $R-G_x(CX_2-CXY-)_n-I$ , where:

- R represents (i) a hydrogen atom, (ii) an atom of an alkali metal, (iii) a linear or branched  $C_1-C_{20}$  alkyl group optionally substituted with one or more groups chosen from phenyl, carboxyl, hydroxyl, nitrile, amine or amidine groups, (iv) a  $C_3-C_8$  cycloalkyl group optionally substituted with one or more groups chosen from  $C_1-C_8$  alkyl groups and the nitrile group, or (v) a phenyl group, optionally substituted with one or more groups chosen from the  $C_1-C_8$  alkyl groups and halogen atoms other than the iodine atom;
- x represents an integer equal to 0 or 1;
- G represents  $-O-$ ,  $-O-C(=O)-O-$ ,  $-C(=O)-O-$  or  $-O-S(=O)_p-O-$ ;  
if G is a group  $-C(=O)-O-$ , then its fragment  $C(=O)$  is linked to R and its fragment O linked to a group  $CX_2$ ;
- p represents an integer equal to 1 or 2;

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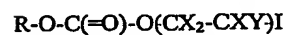
- n represents an integer equal to 1 to 8;
- the groups X represent, independently of each other and of Y, (i) a hydrogen atom, (ii) a halogen atom other than an iodine atom, or (iii) a linear or branched C<sub>1</sub>-C<sub>20</sub> alkyl group;
- 5 - Y represents (i) a halogen atom other than an iodine atom,
  - (ii) a phenyl group optionally substituted with one or more atoms chosen from halogen atoms other than the iodine atom and C<sub>1</sub>-C<sub>8</sub> alkyl groups,
  - (iii) a group -O-C(=O)-Z, (iv) a nitrile group,
  - (v) a group -C(=O)-O-Z, or (vi) a group -C(=O)-NZ<sub>2</sub>;
- 10 - Z represents (i) a hydrogen atom, or (ii) a saturated or ethylenically unsaturated or aromatic C<sub>1</sub>-C<sub>20</sub> hydrocarbon group;
- R, G, x, CX<sub>2</sub>-CXY and n are identical for the 2 substances which are the subject of the invention;
- I is an iodine atom
- 15 [substances (S2)].

11. Mixture according to Claim 10, characterized in that the substances (S2) have a number-average molecular mass of less than 500.

12. Iodinated organic substance having a molecular mass of less than 2000, corresponding to the general formula  $R-G(CX_2-CXY)_q-I$ ,

- 20 with R, G, X, Y and I as defined in Claim 10 and where q represents an integer greater than 1 and less than 10.

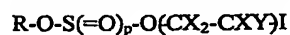
13. Iodinated organic substance having a molecular mass of less than 2000, corresponding to the general formula



- 25 with R, X, Y and I as defined in Claim 10.

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14. Iodinated organic substance having a molecular mass of less than 2000, corresponding to the general formula



with R, X, Y, I and p as defined in Claim 10.

5 15. Iodinated organic substance according to any one of Claims 12 to 14, characterized in that it has a molecular mass of less than 1000.

16. Process for preparing a polymer by free-radical polymerization of at least one ethylenically unsaturated monomer, using in the polymerization:

(A') the ethylenically unsaturated monomer,

10 (B') at least one free-radical-generating agent chosen from peroxides, diazo compounds, dialkyldiphenylalkanes, substances derived from tetraphenylethane, boranes, iniferter substances comprising at least one thiuram disulphide group, styrene and styrene substances, and ultraviolet radiation,

15 (C') one or more substances chosen from the substances (S) prepared by the process according to any one of Claims 1 to 9, the substances (S2) of the mixtures according to Claim 10 or 11 and the substances according to any one of Claims 12 to 15, and,

optionally in addition,

20 (D') at least one complex of a metal chosen from transition metals, lanthanides, actinides and group IIIa metals, and of a ligand of this metal.